



Armed Forces College of Medicine AFCM



The parathyroid Hormone
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Ass. Prof. of Physiology

INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

1. List the target organs for parathyroid hormone
2. Summarize its effects on the target organs
3. Explain how PTH secretion is regulated
4. differentiate between the consequences of hypo and hyper secretion of PTH.
5. Compare between latent and manifested tetany

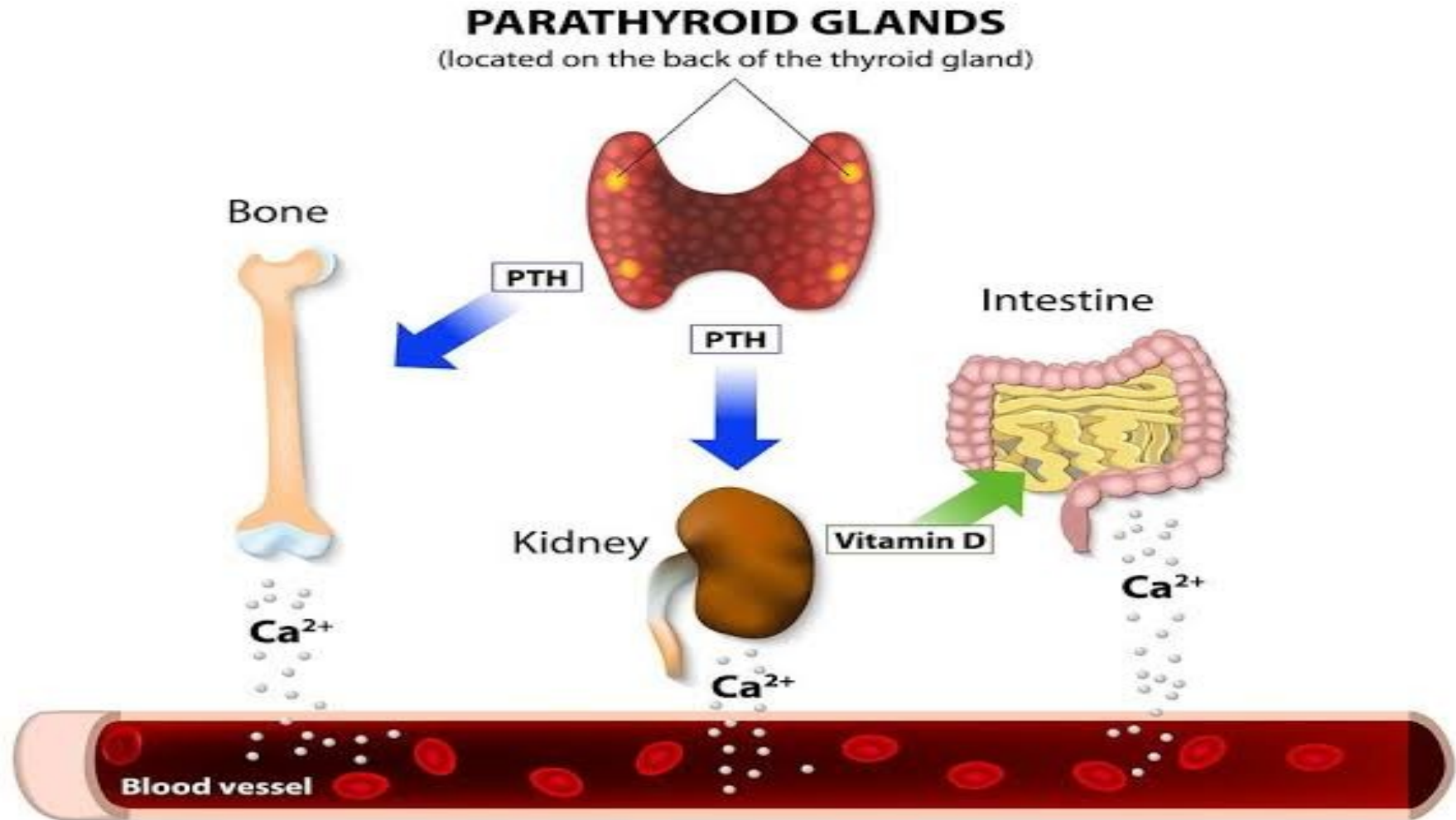
Actions of PTH



Actions of PTH

• PTH increases Ca^{2+} and decreases Pi

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Actions of PTH



•Skeleton:

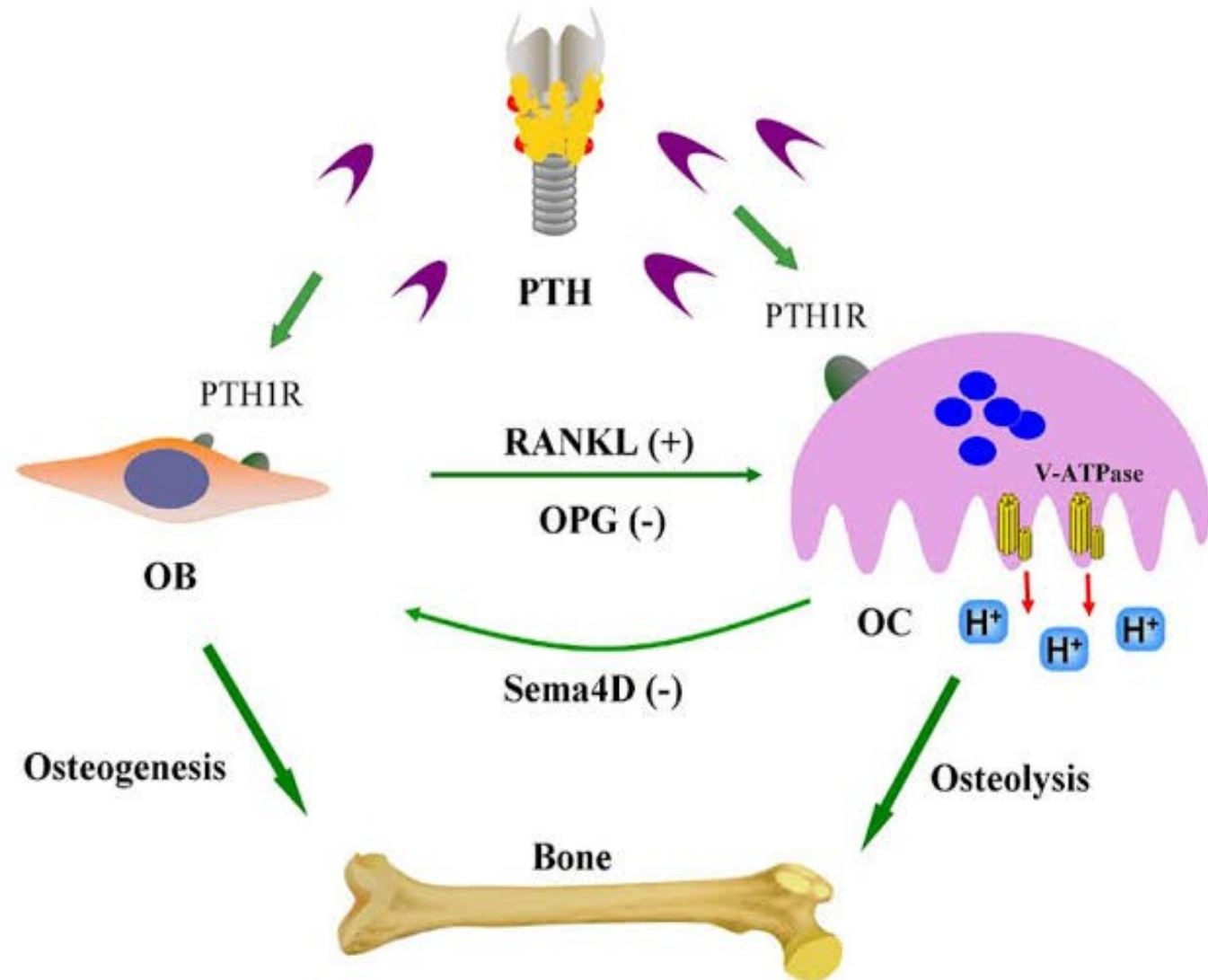
Immediate: increase Ca^{2+} mobilization from bone within minutes and for hours :

How?

•Active form of vitamin D increase bone

Delayed: takes days to weeks:

•Increase osteoclastic activity lead to localized bone dissolution.



•Increase new osteoclast

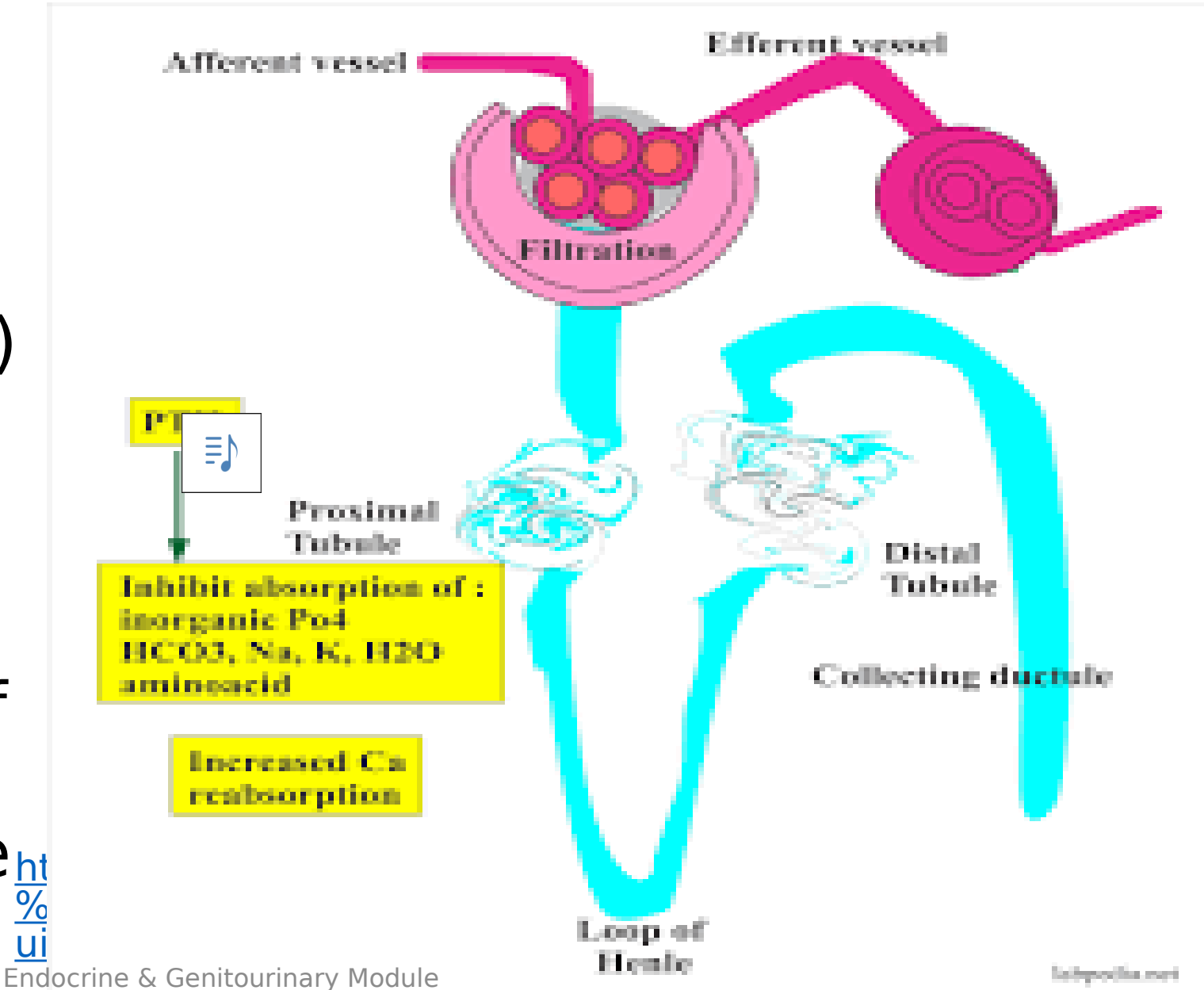
Actions of PTH



• Kidneys:

- ✓ Stimulate reabsorption of Ca^{2+} in..... **DCT**
- ✓ It decreases the plasma phosphate (P) level.
as decrease P_i
PCT absorption in.....
- ✓ Increase activation of 1, 25-dihydroxycholecalciferol (1, 25-DHCC).

New Five Year Program



Endocrine & Genitourinary Module

lailypedia.net

Regulation of PTH Secretion



1. Plasma Ca^{2+} and Mg^{2+} levels:

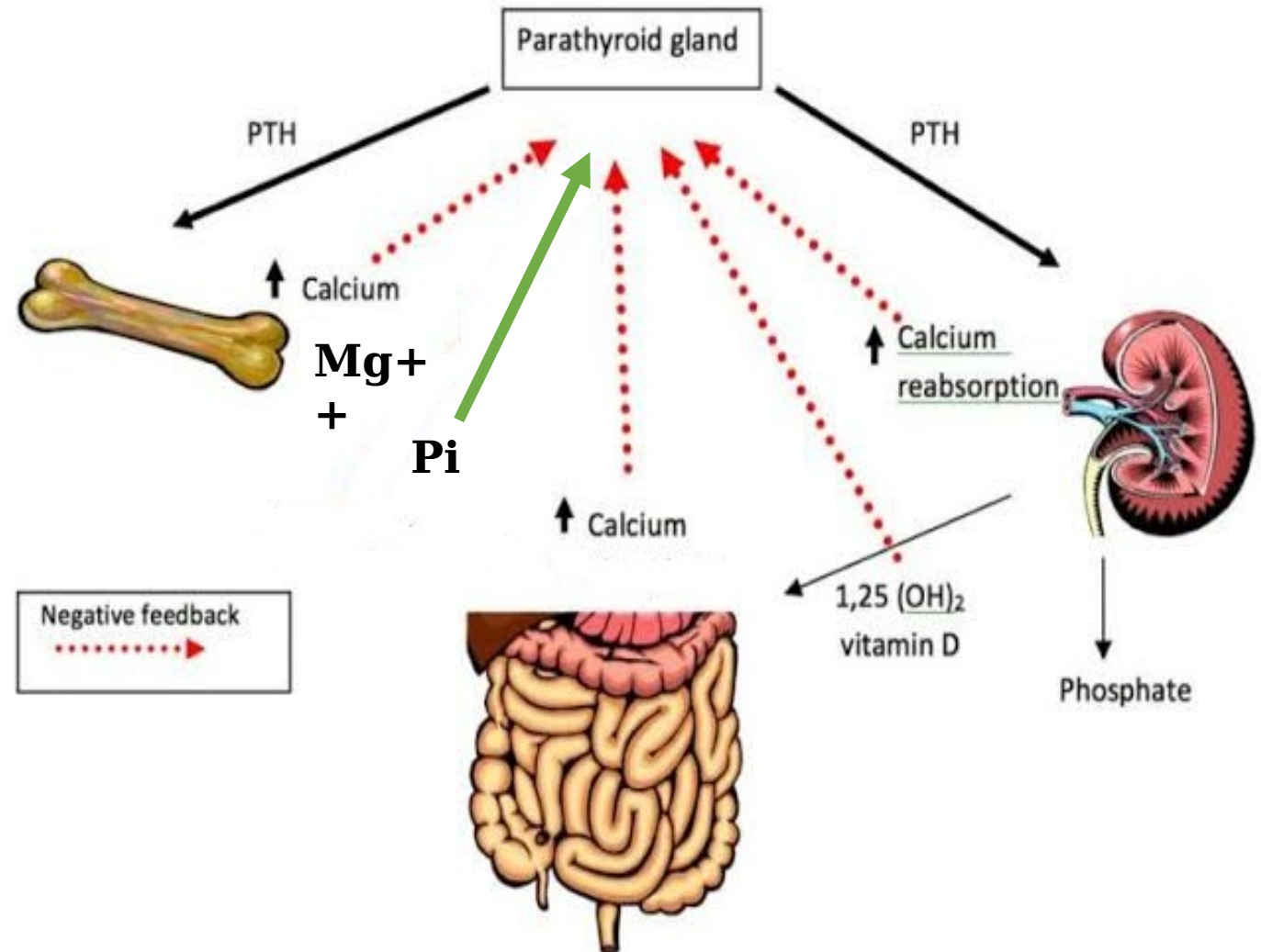
Inverse relationship

2. Active vit D (DHCC):

Inverse relationship

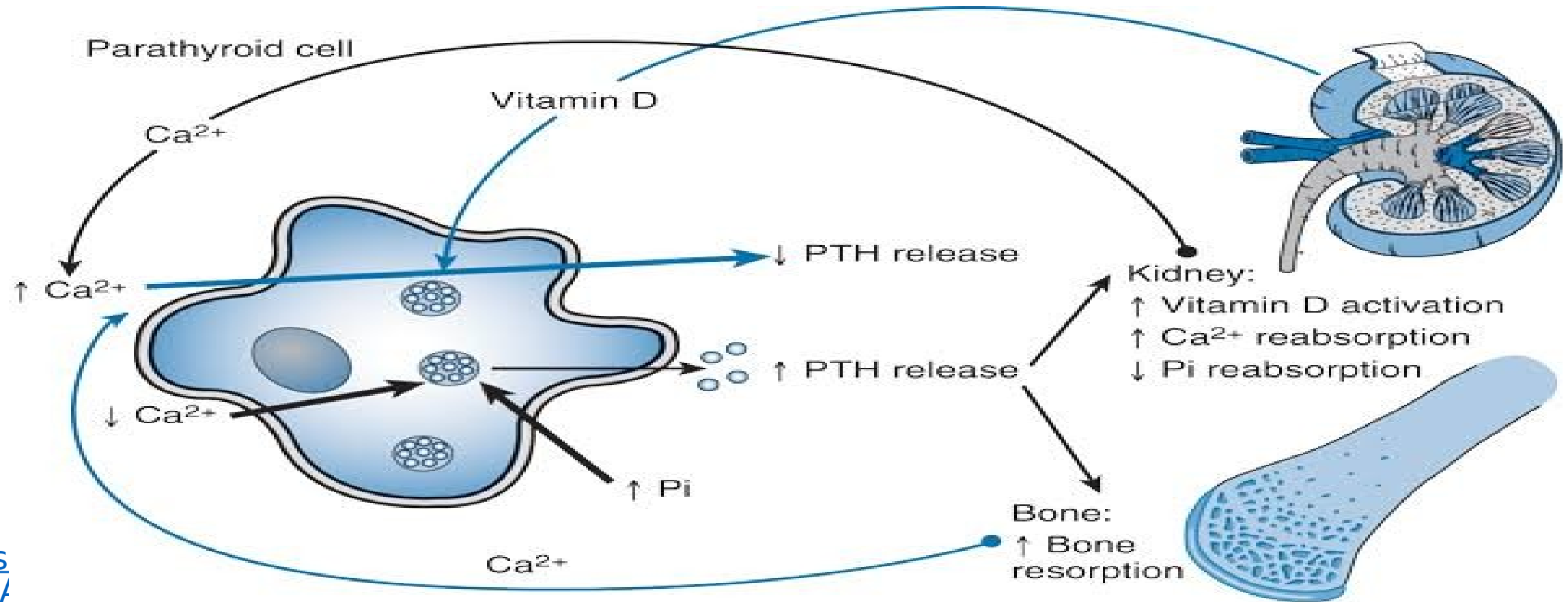
3. phosphate level:

Direct relationship



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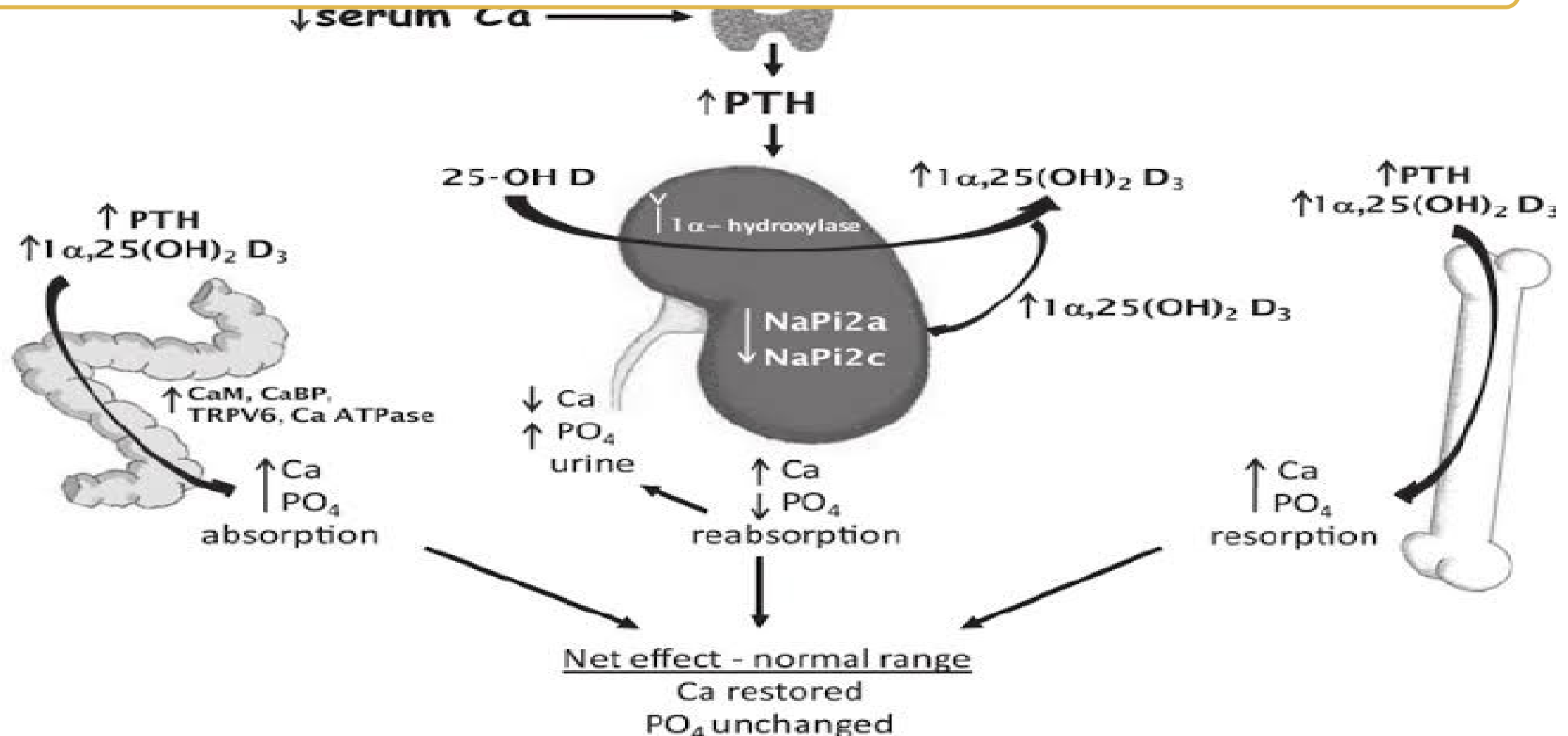
Regulation of PTH Secretion



<https://nDGC.com>

Source: Molina PE: *Endocrine Physiology*, 4th Edition: www.accessmedicine.com
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Effect of PTH secretion in response to decreased Ca^{++} level



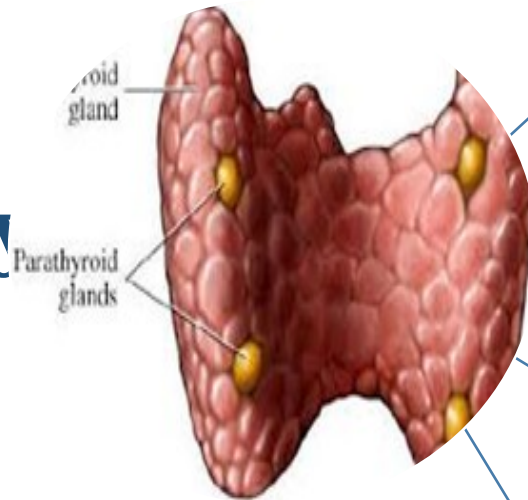
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Hyperparathyroidism



Causes:

- 1) Primary :
adenoma
- 2) Secondary
in rickets
and renal
failure result
in sever loss



Bone

Bone cyst
Bone fracture

Kidney

Stones due
to excess
Ca++ loss

Heart

Arrhythmias

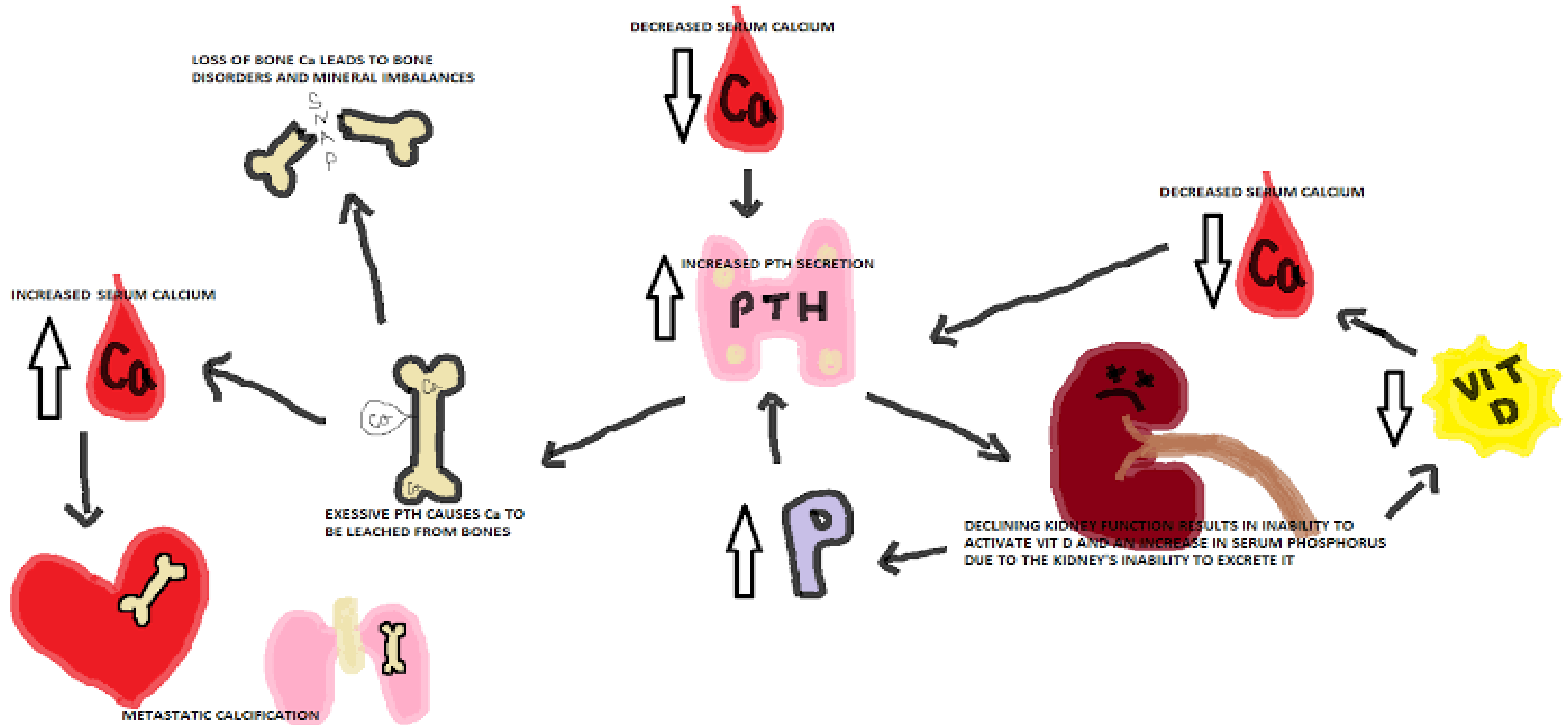
Muscle

Weakness

GIT

Nausea and
constipation

Hyperparathyroidism



Hypoparathyroidism



Causes:

Most common is surgical removal with thyroidectomy

Manifestation:

Hypocalcemia
and Tetany

Tetany



- **Definition:** A state of **spastic contraction** of the **skeletal muscle** caused by **increased neuromuscular excitability** as a result of **decreased ionized plasma calcium level**.

Normal Ca^{++} level: 9-11mg/dl

- **Causes: Hypocalcemia** due to:

Hypoparathyroidism

Vit D deficiency

↓ dietary Ca^{++}

Steatorrhea

Renal failure

Alkalemia

Tetany



Normal Ca^{++} level: 9-11mg/dl
↓ Ca^{++} level □ Tetany

Latent Tetany

Ca^{++} level: 7-9mg/dl

***Symptoms absent at rest
appear in certain situations**

**e.g. Stress &
Hyperventilation and
Pregnancy**

Became manifest by

***Provocative tests:**

- **Trousseau's Sign**
- **Chvostek's Sign**
 - **Erb's Sign**

Manifest Tetany

Ca^{++} level: < 7mg/dl

***Appear during rest**

***Attacks of tetanic (Tonic-
Clonic) contractions □
convulsions**

***Suffocation if affecting
laryngeal muscles**

***Carpopedal spasm**

*** Cardiac arrhythmia: Long QT
interval and ST segment**

***Intestinal and biliary colic**

Manifest Tetany



Latent Tetany



Trousseau sign:

- A blood pressure cuff is inflated to a pressure above the patient systolic level.
- Pressure is continued for several minutes.
- Carpal spasm:
 - * flexion at the wrist
 - * flexion at the MP joints
 - * extension of the IP joints
 - * adduction of the thumb



Provocative test for Latent Tetany



ASSESSMENT TIP

Eliciting Chvostek's sign

Begin by telling the patient to relax his facial muscles. Then stand directly in front of him, and tap the facial nerve either just anterior to the earlobe and below the zygomatic arch or between the zygomatic arch and the corner of his mouth. A positive response varies from twitching of the lip at the corner of the mouth to spasm of all facial muscles, depending on the severity of hypocalcemia.



b



Trousseau Sign

Treatment of Tetany

- Ca supplementation

Calcium
gluconate IV
slowly

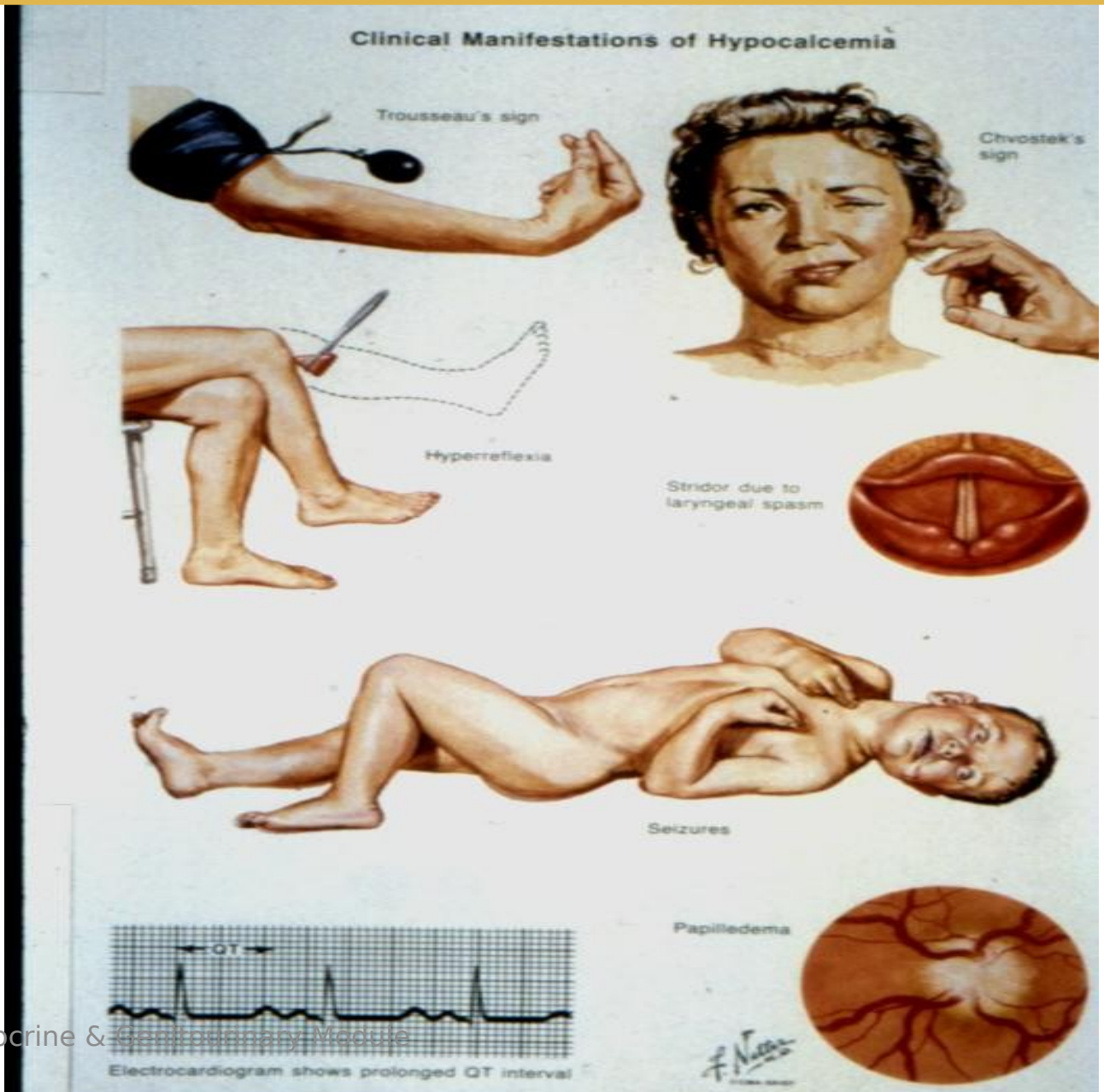
Oral Calcium

Diet rich

Calcium

- Vit.D injection

- Treatment of



Lecture Quiz



1) Parathyroid hormone action includes:

- a) indirectly increases calcium absorption from the intestine
- b) increases phosphate reabsorption in the kidney **A**
- c) decreases calcium release from bone
- d) decreases production of active vitamin D3 in the kidney
- e) stimulate calcitonin secretion

2) Parathyroid hormone secretion is directly controlled by:

- f) 25-hydroxycholecalciferol level **b**
- g) Calcium level
- h) Calbindin -D level
- i) 24, 25-dihydroxycholecalciferol
- j) Phosphate level

SUGGESTED TEXTBOOKS



1. Ganong review of medical physiology 23rd edition from page 485 to 489
2. Ghyton text book 13th edition from page 1009 to 1012